Section 1.
Introduction to the
National Electrical Safety Code

010. Purpose

The purpose of these rules is the practical safeguarding of persons during the installation, operation, or maintenance of electric supply and communication lines and associated equipment.

These rules contain the basic provisions that are considered necessary for the safety of employees and the public under the specified conditions. This code is not intended as a design specification or as an instruction manual.

011. Scope

These rules cover supply and communication lines, equipment, and associated work practices employed by a public or private electric supply, communications, railway, or similar utility in the exercise of its function as a utility. They cover similar systems under the control of qualified persons, such as those associated with an industrial complex or utility interactive system.

NESC rules do not cover installations in mines, ships, railway rolling equipment, aircraft, or automotive equipment, or utilization wiring except as covered in Parts 1 and 3. For building utilization wiring requirements, see the National Electrical Code, ANSI/NFPA 70-1990 [47].[1]

012. General Rules

A. All electric supply and communication lines and equipment shall be designed, constructed, operated, and maintained to meet the requirements of these rules.

B. The utilities, authorized contractors, or other entities, as applicable, performing design, construction, operation, or maintenance tasks for electric supply or communication lines or equipment covered by this code shall be responsible for meeting applicable requirements.

C. For all particulars not specified in these rules, construction and maintenance should be done in accordance with accepted good practice for the given local conditions.

013. Application

A. New Installations and Extensions

1. These rules shall apply to all new installations and extensions, except that they may be waived or modified by the administrative authority. When so waived or modified, safety shall be provided in other ways.
   EXAMPLE: Alternative working methods, such as the use of barricades, guards, or other electrical protective equipment, may be implemented along with appropriate alternative working clearances as a means of providing safety when working near energized conductors.
2. Types of construction and methods of installation other than those specified in the rules may be used experimentally to obtain information, if done where qualified supervision is provided.

[1]The numbers in brackets correspond to those of the references in Section 3.

EXCEPTION: The conductor temperature and loading condition for trolley and electrified railroad contact conductors shall be 60 °F (15 °C), no wind displacement, final unloaded sag, or initial unloaded sag in cases where these facilities are maintained approximately at initial unloaded sags.
NOTE: The phase and neutral conductors of a supply line are normally considered separately when determining the sag of each due to temperature rise.

B. Clearance of Wires, Conductors, Cables, and Equipment Mounted on Supporting Structures

1. Clearance to Wires, Conductors, and Cables
The vertical clearance of wires, conductors, and cables above ground in generally accessible places, roadway, rail, or water surfaces, shall be not less than that shown in Table 232-1.
2. Clearance to Unguarded Rigid Live Parts of Equipment
The vertical clearance above ground or roadway surfaces for unguarded rigid live parts such as potheads, transformer bushings, surge arresters, and short lengths of supply conductors connected thereto, which are not subject to variation in sag, shall be not less than that shown in Table 232-2.
3. Clearance to Equipment Cases
The vertical clearance of equipment cases above ground or roadway surfaces shall be not less than that shown in Table 232-2.
4. Street and Area Lighting
   a. All exposed ungrounded conductive parts of luminaires and their supports that are not insulated from current-carrying parts shall be maintained at not less than 20 in (500 mm) from the surface of their supporting structure.
   EXCEPTION 1: This may be reduced to 5 in (125 mm) if located on the side of the structure opposite the designated climbing space.
   EXCEPTION 2: This does not apply where the equipment is located at the top or other vertical portion of the structure that is not subject to climbing.
   b. Insulators, as specified in Rule 279A, should be inserted at least 8 ft (2.45 m) from the ground in metallic suspension ropes or chains supporting lighting units of series circuits.

C. Additional Clearances for Wires, Conductors, Cables, and Unguarded Rigid Live Parts of Equipment
Greater clearances than specified by Rule 232B shall be provided where required by Rule 232C1.

1. Voltages Exceeding 22 Kilovolts
   a. For voltages between 22 and 470 kV, the clearance specified in Rule 232B1 (Table 232-1) or Rule 232B2 (Table 232-2) shall be increased at the rate of 0.4 in (10 mm) per kilovolt in excess of 22 kV. For voltages exceeding 470 kV, the clearance shall be determined by the method given in Rule 232D. All clearances for lines over 50 kV shall be based on the maximum operating voltage.
   EXCEPTION: For voltages exceeding 98 kV ac to ground or 139 kV dc to ground, clearances less than those required above are permitted for systems with known maximum switching-surge factors (see Rule 232D).
   b. For voltages exceeding 50 kV, the additional clearance specified in Rule 232C1a shall be increased 3% for each 1000 ft (300 m) in excess of 3300 ft (1000 m) above mean sea level.
   c. For voltages exceeding 98 kV ac to ground, either the clearances shall be increased or the electric field or the effects thereof shall be reduced by other means, as required, to limit the steady-state current due to electrostatic effects to 5 mA, rms, if the largest anticipated truck, vehicle, or equipment under the line were short-circuited to ground. The size of the anticipated truck, vehicle, or equipment used to determine these clearances may be less than but need not be greater than that limited by federal, state,

or local regulations governing the area under the line. For this determination, the conductors shall be at a final unloaded sag at 120 °F (50 °C).

D. Alternate Clearances for Voltages Exceeding 98 Kilovolts Alternating Current to Ground or 139 Kilovolts Direct Current to Ground

The clearances specified in Rules 232B and 232C may be reduced for circuits with known switching-surge factors, but shall be not less than the alternate clearance, which is computed by adding the reference height from Rule 232D2 to the electrical component of clearance from Rule 232D3.

1. Sag Conditions of Line Conductors
   The vertical clearance shall be maintained under the conductor temperature and loading condition given in Rule 232A.
2. Reference Heights
   The reference height shall be selected from Table 232-3.
3. Electrical Component of Clearance
   a. The electrical component (D) shall be computed using the following equations. Selected values of D are listed in Table 232-4.

$$D = 3.28 \left[\frac{V \cdot (PU) \cdot a}{500\,K} \right]^{1.667} bc \text{ (ft)}$$

$$D = 1.00 \left[\frac{V \cdot (PU) \cdot a}{500\,K} \right]^{1.667} bc \text{ (m)}$$

where

V = maximum ac crest operating voltage to ground or maximum dc operating voltage to ground in kilovolts;

PU = maximum switching-surge factor expressed in per-unit peak voltage to ground and defined as a switching-surge level for circuit breakers corresponding to 98% probability that the maximum switching surge generated per breaker operation does not exceed this surge level, or the maximum anticipated switching-surge level generated by other means, whichever is greater;

a = 1.15, the allowance for three standard deviations;

b = 1.03, the allowance for nonstandard atmospheric conditions;

c = 1.2, the margin of safety;

K = 1.15, the configuration factor for conductor-to-plane gap.

   b. The value of D shall be increased 3% for each 1000 ft (300 m) in excess of 1500 ft (450 m) above mean sea level.
   c. For voltages exceeding 98 kV ac to ground, either the clearances shall be increased or the electric field or the effects thereof shall be reduced by other means, as required, to limit the steady state current due to electrostatic effects to 5 mA, rms, if the largest anticipated truck, vehicle, or equipment under the line were short-circuited to ground. The size of the anticipated truck, vehicle, or equipment used to determine these clearances may be less than but need not be greater than that limited by federal, state, or local regulations governing the area under the line. For this determination, the conductors shall be at a final unloaded sag at 120 °F (50 °C).
4. Limit
   The alternate clearance shall be not less than the clearance given in Tables 232-1 or 232-2 computed for 98 kV ac to ground in accordance with Rule 232C.